

## PATENT ABSTRACTS OF JAPAN

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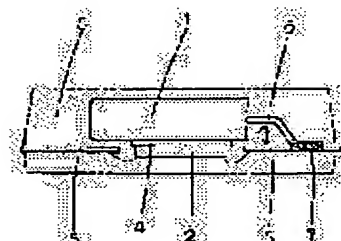
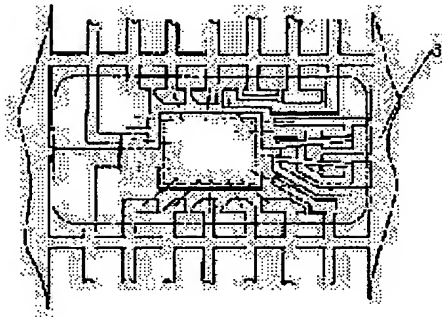
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## (54) PIEZOELECTRIC OSCILLATOR

## (57)Abstract:

**PURPOSE:** To reduce a surface mounting area and to simplify wiring among a semiconductor element, a crystal oscillator and a lead frame by arranging a piezoelectric vibrator and a semiconductor on the front and rear of a metallic frame respectively.

**CONSTITUTION:** The piezoelectric vibrator 1 and the semiconductor 2 for electrically oscillating the vibrator 1 are respectively arranged on the front and rear sides of the metallic frame 3, a tab 4 of the frame 3 to which the semiconductor 2 is fixed is pushed out to the vibrator 1 side and comes into contact with the vibrator 1 in parallel to secure clearance between the vibrator 1 and plural metallic leads 5. In addition to the prevention of electric connection between the vibrator 1 and plural metallic leads 5, short-circuits among the leads 5 can also be prevented. As compared with the arrangement of the vibrator 1 and the semiconductor 2 in the plane direction, this piezoelectric oscillator is assembled by about 1/2 in plane size and the minimum total thickness of constitutional parts is secured.



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CLAIMS

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[Claim(s)]

[Claim 1] In the piezo oscillator with which resin shaping of the metal leadframe which consists of a semi-conductor (IC) which oscillates a piezoelectric transducer and said piezoelectric transducer electrically at least, and two or more metal leads and a tab was carried out Said piezoelectric transducer is plated for the case object plug object with the solder of 90% or more of lead contents. And the piezo oscillator with which said plug object with which soldering of the oscillating piece is carried out to said plug object said solder, and soldering of said oscillating piece was carried out is characterized by carrying out airtight press fit at said case object through said solder.

[Claim 2] The piezo oscillator given in the 1st term of a patent claim characterized by for the lead terminal and said metal leadframe of said piezoelectric transducer by which \*\* RIMEKKI is carried out having an alloy layer containing the solder of said presentation in the solder of said presentation, and welding them to it.

[Claim 3] Said piezoelectric transducer and said semi-conductor are respectively arranged to said metal frame at the relation of a table flesh side. The tab of said metal frame which said semi-conductor fixed to said piezoelectric transducer side The piezo oscillator given in the 1-th term of a patent claim characterized by for the metal lead side of said number of \*\* and parallel having extruded, having contacted the case object of said piezoelectric transducer, and parallel, and having secured the path clearance of the electric insulation with the case object of said piezoelectric transducer, and two or more metal leads.

[Claim 4] Said piezoelectric transducer is a piezo oscillator given in the 1st term of a patent claim characterized by acting as the \*\*\*\*\*-king of said oscillating piece, and pressing it fit within the half-melting condition temperature of a solder state diagram in said plug object by which soldering was carried out, and said case object.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the structure of a piezo oscillator.

[0002]

[Description of the Prior Art] The conventional piezo oscillator was indicated by the Provisional-Publication-No. 6 I-I No. 9204 official report, and was carrying out resin shaping of the metal lead which connects these with the semi-conductor 12 which oscillates electrically a piezoelectric transducer 11 and said piezoelectric transducer 11 electrically with structure as shown in drawing 9 . Since the appearance side was main, the case object of the piezoelectric transducer 11 used here and the plug object were plated with the solder of 40% or less of lead contents, and the oscillating piece was used as the plug object with the pewter with the solder of said presentation, and that by which vacuum pressure close [ of the plug object ] is carried out to the case was known by making the solder of said presentation into shielding material.

[0003]

[Problem(s) to be Solved by the Invention] However, with the above-mentioned conventional technique, when using as SMT (Surface Mount Technology) components, at the time of mounting to a substrate, 220-260-degreeC be reached, and the entire component had the fundamental trouble of fusing and, otherwise, had produce property degradation call the shift of the frequency of a piezoelectric transducer, and an equivalent resistance value in elevated temperature aging by the gas emit out of solder plating in the solder of a presentation of 40% or less of lead contents.

[0004] Then, the place which this invention solves a trouble which was described above and made into the purpose has the thermal resistance which can be equal to the SMT mounting correspondence more than 260-degreeC, and is located in the place which offers the piezo oscillator which was excellent in the elevated-temperature frequency aging property.

[0005]

[Means for Solving the Problem]

(1) In the piezo oscillator with which resin shaping of the metal leadframe which the piezo oscillator of this invention becomes from the semi-conductor (IC) which oscillates a piezoelectric transducer and said piezoelectric transducer electrically at least, two or more metal leads, and a tab was carried out Said piezoelectric transducer is plated for the case object plug object with the solder of 90% or more of lead contents. And said plug object with which soldering of the oscillating piece is carried out to said plug

object said solder, and soldering of said oscillating piece was carried out is characterized by carrying out airtight press fit at said case object through said solder.

[0006] (2) The piezo oscillator of this invention is characterized by for the lead terminal and said metal leadframe of said piezoelectric transducer by which \*\* RIMEKKI is carried out having an alloy layer containing the solder of said presentation in the solder of said presentation, and welding them to it.

[0007] (3) Said piezoelectric transducer and said semi-conductor are respectively arranged to said metal frame at the relation of a table flesh side, the tab of said metal frame which said semi-conductor fixed is extruded by said two or more lead sides and parallel to said piezoelectric transducer side, and contacts the case object of said piezoelectric transducer, and parallel, and the piezo oscillator of this invention is characterized by to have secured the path clearance of the electric insulation with the case object of said piezoelectric transducer, and two or more metal leads.

[0008] (4) The piezo oscillator of this invention is characterized by having acted as the \*\*\*\*\*-king of said piezo-electric oscillating piece, and pressing it fit within the half-melting condition temperature of a solder-like bear Fig., in said plug object by which soldering was carried out, and said case object.

[0009]

[Example] The perspective view of the piezo oscillator in the example of this invention and drawing 1 (b) drawing 1 (a) The assembly top view and drawing 2 (b) which show another example of said piezo oscillator the sectional view of drawing 1 (a), and drawing 2 (a) The sectional view of the piezoelectric transducer with which the built-up-section Fig. of drawing 2 (a) and drawing 3 constitute said piezo oscillator, and drawing 4 are [ the plug object sectional view of said piezoelectric transducer and drawing 6 of the sectional view of the oscillating piece of said piezoelectric transducer and drawing 5 ] the case object sectional views of said piezoelectric transducer. The configuration of an example is explained below. Airtight press fit of the piezo-electric oscillating piece 102 in which the electrode layer 101 first shown in drawing 4 was formed of vacuum evaporation etc. is carried out considering the solder 103 shown in the metal casing 105 which was carried out soldering 106 as solder 103 showed the solder plating 103 of the plug object shown by drawing 5 to the INKE lead 104 side carried out at drawing 3 , and was carried out in the solder plating 103 shown by drawing 6 by drawing 3 as shielding material. Said solder 103 is solder of 90% or more of lead (pb) contents of the solder state diagram shown by drawing 7 , and melting temperature has become more than 260-degreeC. Moreover, although said solder 103 is plated as it was shown to plating processing by \*\* RIKESU object drawing 6 and plug object drawing 5 If there is a trouble that the organic component in plating liquid will be wound around said solder 103 at this time, airtight press fit is carried out as it is and the piezo-electric oscillating piece 102 is enclosed In an elevated temperature (between ordinary temperature - 260-degreeC), extreme increase (it may reach to 100% or more) of an equivalent resistance value and remarkable frequency aging may be produced, and it may result in a halt of an oscillation. Therefore, in case it carries out vaccum pressure close [ of said plug object drawing 5 ] to said case object drawing 6 , there is the need of making a \*\*\*\*\*-king emitting to the deed exterior. It is the temperature of slash circles enclosed as \*\*-king temperature by the eutectic line ab of drawing 7 , the liquidus line ac, and the line of 90% or more of lead contents at this time, and it is possible by carrying out \*\*-king enclosure in this condition to make an organic component emit enough.

[0010] Thereby, the increment in the elevated temperature of an equivalent resistance value is stored to less than several%.

[0011] As the 1st example of the structure of a piezo oscillator, as drawing 1 (b) shows, the semi-conductor

2 which oscillates electrically the piezoelectric transducer 1 shown in the example of this invention explained above and piezo-electric \*\*\*\*\* 1 is arranged superficially, and connects a semi-conductor 2 with a piezoelectric transducer 1 electrically through the metal lead 5 by the metal thin line 9 by wire bonding, and the alloy layer 7 which contained solder 103 by welding, and the oscillator circuit is constituted. Furthermore, it is formed with resin 8 including the piezoelectric transducer 1, the semi-conductor 2, the metal lead 5, and the metal thin line 9.

[0012] The semi-conductor 2 which oscillates electrically said piezoelectric transducer drawing 3 (it sets to drawing 2 and is 1) and piezoelectric transducer 1 as the 2nd example of the structure of a piezo oscillator as shown in drawing 2 (a) and (b) It has been respectively arranged to the metal frame 3 at the relation of a table flesh side, and the tab 4 of the metal frame 3 which the semi-conductor 2 fixed was extruded to the piezoelectric transducer 1 side, it contacted in parallel with a piezoelectric transducer 1, and the path clearance of the electric insulation with a piezoelectric transducer 1 and two or more metal leads 5 is secured. This not only prevents an electric flow with a piezoelectric transducer 1 and two or more metal leads 5, but has prevented the short-circuit between metal lead 5. According to this structure, it becomes the minimum sum total thickness of a component part in about 1/2 and the thickness direction superficially compared with arranging a piezoelectric transducer and a semi-conductor in the direction of a flat surface, and is assembled.

[0013] Furthermore, the lead 6 of a piezoelectric transducer 1 is welded as an alloy layer 7 which contained in the metal lead 5 related to an electric oscillation the solder 103 shown by drawing 5 . Originally, although solder plating is not necessarily needed, since it has plated to an inner side 104 and coincidence in case solder plating 103 is carried out to the plug object shown by drawing 5 , the lead 6 is welded as an alloy layer which contained solder 103 in the metal lead 5 while solder 103 had been attached.

[0014] Finally the whole is fabricated with heat resistant resin 8 including the piezoelectric transducer 1, the semi-conductor 2, the metal lead 5, and the tab 4.

[0015] By the above, the connection of the soldering section 106 of the oscillating piece 102, the case 105, the lead 6 of closure section Fig. of plug object drawing 5 3103 and a piezoelectric transducer, and the metal lead 5 with which the assembly drawing 2 of the piezo oscillator explained in the example serves as the main point of assembly has the composition of having a heatproof more than 260-degreeC altogether including a component part.

[0016] Moreover, although the configuration of the whole example is the SOP type of the flat package corresponding to SMT as it is shown in drawing 1 , it puts and the application to the DIP type as components is also raised as an example.

[0017] Moreover, the application to the J-BEND lead type of a flat package is also raised as an example.

[0018]

[Effect of the Invention] As stated above, according to the piezo oscillator of this invention, the outstanding solder of the thermal resistance of 90% or more of lead contents The case object of a piezoelectric transducer, Plating on a plug object and using as the mounting material of an oscillating piece, and seal shielding material, and by welding the lead of a piezoelectric transducer as an alloy layer which contained the solder of 90% or more of lead contents in the metal lead of a metal frame It has the effectiveness of offering the piezo oscillator which can bear the thermal resistance more than 260-degreeC.

[0019] Moreover, equivalent resistance has the effectiveness of offering the heat-resistant high piezo

oscillator which was small excellent in the elevated-temperature aging property, by carrying out press fit seal of the solder which contained said 90% or more of lead while carrying out the case object of a piezoelectric transducer, and the plug object the \*\*\*\*\*-king within half-melting condition temperature as shielding material.

[0020] Moreover, it has the effectiveness of offering small and the outstanding piezo oscillator of thin thermal resistance, by arranging a piezoelectric transducer and a semi-conductor respectively on both sides of a leadframe, extruding the tab of a leadframe, and taking the structure of securing the insulation with a piezoelectric transducer and a metal lead.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] For (a), the perspective view showing the example of the piezo oscillator of this invention and (b) are the main sectional view (the 1st example) of drawing 1 (a).

[Drawing 2] (a) is the assembly main top view (the 2nd example) of drawing 1 (a), and (b) is the main sectional view (the 2nd example) of drawing 1 (a).

[Drawing 3] The sectional view showing the example of the piezoelectric transducer which is the component part of the piezo oscillator of this invention.

[Drawing 4] The oscillating fragmentation side Fig. of the piezoelectric transducer shown by drawing 3.

[Drawing 5] The plug object sectional view of the piezoelectric transducer shown by drawing 3.

[Drawing 6] The case object sectional view of the piezoelectric transducer shown by drawing 3.

[Drawing 7] The state diagram showing the example of the solder used for the assembly of the piezoelectric transducer shown by drawing 3.

[Drawing 8] The perspective view of the piezo oscillator of \*\*\*\*.

[Drawing 9] The main sectional view of the piezo oscillator of \*\*\*\*.

[Drawing 10] The sectional view of the conventional piezoelectric transducer.

[Description of Notations]

1 .... Piezoelectric transducer in which the example of this invention is shown

2 .... Semi-conductor

3 .... Metal leadframe

4 .... Tab of a leadframe

5 .... Two or more leads of a leadframe

6 .... Lead terminal of a piezoelectric transducer

7 .... Alloy layer including Handa

8 .... Resin

9 .... Metal thin line

11 ... Piezoelectric transducer

12 ... Semi-conductor

18 ... Resin

101 .. Electrode

102 .. Piezo-electric oscillating piece

Solder containing 103..90% or more of lead



104 .. Inner lead of a plug object

105 .. Case object

106 .. The soldering section of a piezo-electric oscillating piece

107 .. A pressure welding or \*\*\*\*\*

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(56) 参考文献 特開 昭62-126657 (J P, A)  
特開 昭62-126656 (J P, A)  
特開 昭52-89090 (J P, A)  
実開 昭61-113414 (J P, U)

(54) 【発明の名称】 圧電発振器

(57) 【特許請求の範囲】

【請求項 1】 圧電振動片がプラグ体に固定され該プラグ体が鉛を 90%以上含有する鉛錫系半田を介してケース体に気密圧入されてなる圧電振動子と、該圧電振動子を発振させる半導体素子と、該半導体素子と前記圧電振動子とを電気的に接続する金属フレームと、を有し、前記圧電振動子と前記半導体素子とは前記半導体素子を載置する前記金属フレームのタブに対して表裏の関係で配置され、前記タブは前記圧電振動子の側へ押し出され前記ケース体と当接し、前記圧電振動子と前記半導体素子と前記金属フレームとが樹脂により一体成形されてなることを特徴とする圧電発振器。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は圧電発振器の構造に関する。

【0002】

【従来の技術】 従来の圧電発振器は、特開昭61-19204号公報に記載され、図9に示すような構造で、圧電振動子11とこの圧電振動子11を電気的に発振させる半導体12とこれらを電気的に接続する金属リードとを樹脂成形していた。ここに使われる圧電振動子11のケース体、プラグ体は外観面の主な理由から鉛含有量40%以下の半田でメッキされ、かつ前記組成の半田で振動片がプラグ体にハンダ付けされ、かつ前記組成のハンダをシールド材としてプラグ体は、ケース体に真空圧入されているものが知られていた。

【0003】

【発明が解決しようとする課題】しかし前述の従来技術では、SMT (Surface Mount Technology) 部品として用いる場合、基板への実装時には、部品全体が220～260℃に達し、鉛含有量40%以下の組成の半田では溶融してしまうという基本的問題点を有し、他に高温エージングにおいて、半田メッキ内から放出されるガスによって圧電振動子の周波数および等価抵抗値のシフトという特性劣化を生じていた。

【0004】そこで本発明は、上記課題を解決するもので、その目的とするところは、260℃以上のSMT実装対応に耐え得る耐熱性を有し、高温周波数エージング特性の優れた、圧電発振器を提供するところにある。

【0005】

【課題を解決するための手段】本発明の圧電発振器は、圧電振動片がプラグ体に固定され該プラグ体が鉛を90%以上含有する鉛錫系半田を介してケース体に気密圧入されてなる圧電振動子と、該圧電振動子を共振させる半導体素子と、該半導体素子と前記圧電振動子とを電氣的に接続する金属フレームと、を有し、前記圧電振動子と前記半導体素子とは前記半導体素子を載置する前記金属フレームのタブに対して表裏の関係で配置され、前記タブは前記圧電振動子の側へ押し出され前記ケース体と当接し、前記圧電振動子と前記半導体素子と前記金属フレームとが樹脂により一体成形されてなることを特徴とする。

【0006】

【0007】

【0008】

【0009】

【発明の実施の形態】図1(a)は、本発明の実施例における圧電発振器の斜視図、図1(b)は、図1(a)の断面図、図2(a)は、圧電発振器の実施例を示す組立平面図、図2(b)は、図2(a)の組立断面図、図3は、前記圧電発振器を構成する圧電振動子の断面図、図4は、前記圧電振動子の振動片の断面図、図5は、前記圧電振動子のプラグ体断面図、図6は、前記圧電振動子のケース体断面図である。

【0010】以下実施例の構成について説明する。まず図4に示される電極膜101が蒸着等のより形成された圧電振動片102は、図5で示されるプラグ体の半田メッキ103をされたインナーリード104側に、半田103で図3に示す様に半田付106され、図6で示される、半田メッキ103をされた金属ケース105に、図3で示される半田103をシールド材として気密圧入されている。前記半田103は、図7で示される半田状態図の鉛(Pb)含有量90%以上の半田であり、熔融温度は260℃以上となっている。また前記半田103は、メッキ加工によりケース体(図6)およびプラグ体(図5)で示されたとおりにメッキされるが、この時メッキ液内の有機成分が前記半田103にまき込まれてし

まうという問題点があり、そのまま気密圧入して圧電振動片102を封入してしまうと、高温(常温～260℃間)において等価抵抗値の極端な増大(100%以上に達する場合もある)、著しい周波数エージングを生じ、発振の停止に至ることもある。従って前記プラグ体(図5)を前記ケース体(図6)に真空圧入する際、加熱ベーキングを行ない外部に放出させてしまう必要性がある。この時ベーキング温度としては図7の共晶線ab、液相線ac、鉛含有量90%以上の線で囲われた斜線部内の温度であり、この状態でベーキング封入することにより十分有機成分を放出させることが可能である。これにより等価抵抗値の高温での増加は、数%以内に収められる。

【0011】圧電発振器の構造の第1の実施例としては、図1(b)で示す様に、以上説明してきた本発明の実施例で示す圧電振動子1と圧電振動子1を電氣的に共振させる半導体2が平面的に配置され、金属リード5を介してワイヤーボンディングによる金属細線9、溶接により半田103を含んだ合金層7により圧電振動子1と半導体2を電氣的に接続し発振回路を構成している。さらに圧電振動子1、半導体2、金属リード5、金属細線9を含んで樹脂8により形成されている。

【0012】圧電発振器の構造の第2の実施例としては、図2(a)、(b)に示すように前記圧電振動子図3(図2においては1)と圧電振動子1を電氣的に共振させる半導体2が、金属フレーム3に対して各々表裏の関係に配置され、半導体2が固着された金属フレーム3のタブ4が、圧電振動子1側へ押し出されて、圧電振動子1と平行に接触して、圧電振動子1と複数の金属リード5との電氣的絶縁のクリアランスを確保している。これは圧電振動1と複数の金属リード5との電氣的導通を防止するだけでなく、金属リード5相互間のショートをも防止している。この構造により、圧電振動子と半導体を平面方向に配置するのに比べ、平面的には1/2、厚み方向では、構成部品の最小合計厚みとなって組み立てられている。

【0013】さらに圧電振動子1のリード6は、電氣的発振に関係する金属リード5に、図5で示される半田103を含んだ合金層7として溶接されている。本来リード6は、半田メッキを必ずしも必要とするものではないが、図5で示されるプラグ体に半田メッキ103を行なう際にインナー側104と同時にメッキしているので、半田103が付いたままで金属リード5に半田103を含んだ合金層として溶接されている。

【0014】最後に圧電振動子1、半導体2、金属リード5およびタブ4を含んで全体が耐熱性樹脂8により成形されている。

【0015】以上により、実施例で説明してきた圧電発振器の組立図2は、組立の要点となる、振動片102の半田付部106、ケース105とプラグ体(図5)の封

止部（図3）の半田103、圧電振動子のリード6と金属リード5との接続部は、構成部品を含めて全て260℃以上の耐熱を有する構成となっている。

【0016】また実施例での全体の形状は、図1に示すとおりSMT対応のフラットパッケージのSOPタイプであるが、差し部品としてのDIPタイプへの応用も実施例としてあげられる。

【0017】またフラットパッケージのJ-BENDリードタイプへの応用も実施例としてあげられる。

【0018】

【発明の効果】本発明は、以上説明されたように構成されているので、以下に記載されるような効果を奏する。

（1）鉛を90%以上含有する鉛錫系半田を介してプラグ体とケース体とが気密圧入されているので、この圧電振動器を基板に実装する際に260℃以上の温度に耐えることができ、高温周波数エージング特性の優れた圧電振動器を提供できる。

（2）タブを圧電振動子の側へ押し出してケース体に当接させることにより、圧電振動子は圧電振動器の厚味方向の動きが規制され、樹脂により一体成形するときに振動子が動き難く、信頼性の高い一体成形が可能となる。さらに、タブとケース体とが接触しているので圧電振動器の厚みを構成部品の最小合計厚みにできる。

（3）圧電振動子と半導体素子とがタブに対して表裏の関係で配置されているので、これらが平面的に配置されている場合に比べて平面的な面積を約半分にし、小型の圧電振動器を提供できる。

【図面の簡単な説明】

【図1】（a）は、本発明の圧電振動器の実施例を示す斜視図、（b）は、図1（a）の主要断面図（第1の実施例）。

【図2】（a）は、図1（a）の組立主要平面図（第2

の実施例）、（b）は、図1（a）の主要断面図（第2の実施例）。

【図3】本発明の圧電振動器の構成部品である圧電振動子の実施例を示す断面図。

【図4】図3で示す圧電振動子の振動片断面図。

【図5】図3で示す圧電振動子のプラグ体断面図。

【図6】図3で示す圧電振動子のケース体断面図。

【図7】図3で示す圧電振動子の組立に使う半田の実施例を示す状態図。

10 【図8】従来の圧電振動器の斜視図。

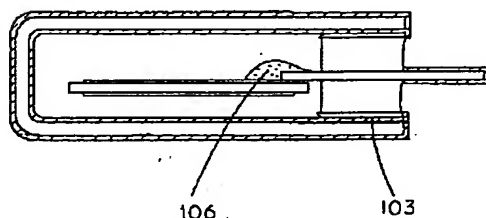
【図9】従来の圧電振動器の主要断面図。

【図10】従来の圧電振動子の断面図。

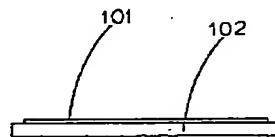
【符号の説明】

- 1・・・本発明の実施例を示す圧電振動子
- 2・・・半導体
- 3・・・金属リードフレーム
- 4・・・リードフレームのタブ
- 5・・・リードフレームの複数のリード
- 6・・・圧電振動子のリード端子
- 20 7・・・半田を含んだ合金層
- 8・・・樹脂
- 9・・・金属細線
- 11・・・圧電振動子
- 12・・・半導体
- 18・・・樹脂
- 101・・・電極
- 102・・・圧電振動片
- 103・・・90%以上の鉛を含んだ半田
- 104・・・プラグ体のインナーリード
- 30 105・・・ケース体
- 106・・・圧電振動片の半田付部
- 107・・・圧接または溶接鈔

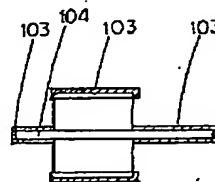
【図3】



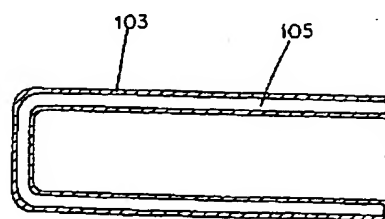
【図4】



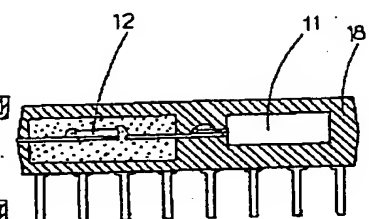
【図5】



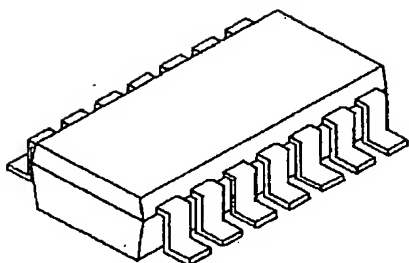
【図6】



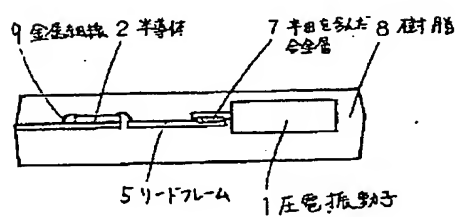
【図9】



【図1】

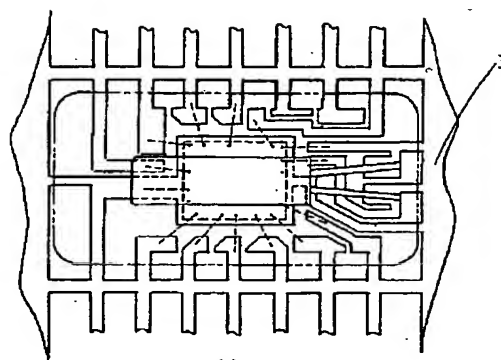


(a)

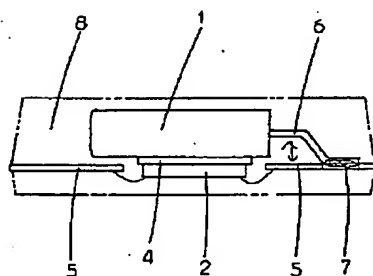


(b)

【図2】

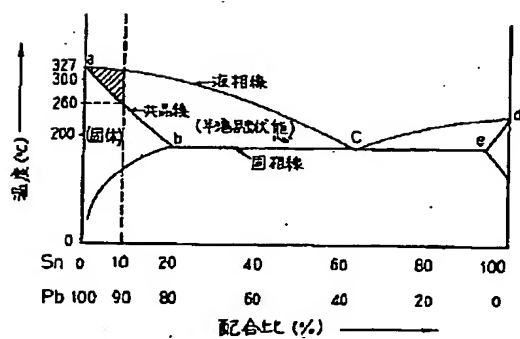


(a)

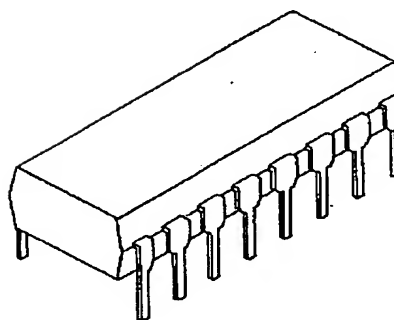


(b)

【図7】



【図8】



(5)

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【図10】

